1Pa081 Cavity Ring-Down Spectroscopic Study of Wulf-Chappuis Band of Ozone

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1. Introduction

Ozone is a well known molecule. The absorption cross-section of ozone has already investigated by many researchers. But the absorption cross-section of Wulf-Chappuis band region is not well established because of the too small cross-section hardly be determined the correct value by conventional method and also the O_2 absorption overlap with in the region 759nm~768nm. There are only a few reports on the temperature dependence in 759-768 nm. Those reported results are contradicting. In previous reports absorption cross-section were not measured by high sensitive methods and spectral resolution were not enough to remove the effect of O_2. Because Cavity Ring-Down Spectroscopy (CRDS) is high spectral resolution system, one can remove the O_2 influence from the gained absorption cross-sections.

So far, the atmospheric temperature has been measured by using planes or balloons. But this measurement costs much, and moreover it is restricted area and time. An atmospheric spectrum that is measured by satellite is shown in Fig. 1. If we can subtract ozone contribution from Fig. 1, we can determine the atmospheric temperature by analyzing O_2 spectrum with Boltzmann distribution equation. This calculation provides useful information.

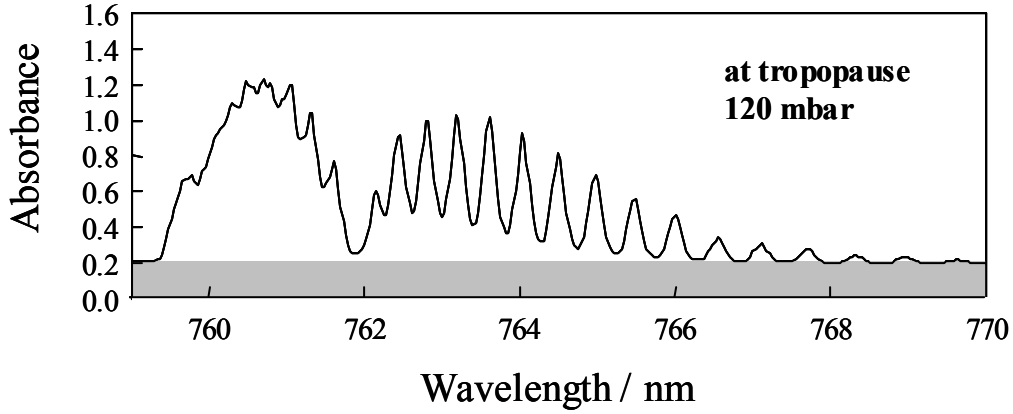

Fig. 1 NIES 衛星観測データ

2. Experimental

In this work, we determined the absolute value of absorption cross-section of

ozone at 761.9nm and its temperature dependence by CRDS. We used a dye laser (LambdaPhysik ScanMate; oxadin750 Dye) pumped by the 532-nm output of a Nd:YAG laser (Quantel Briliant β). All experiments were conducted under the conditions of total pressure 40-50 Torr. The fractional flows of sample gases were measured and regulated by mass flow controllers (KOFLOC: 3660). Ozone was produced by a silent discharge in high purity O_2 (> 99.995%) gas. A typical concentration of ozone was 10^{14}-10^{15} molecules cm^{-3}. The total gas flow rate was kept constant at 1.0 x 10^3 cm^3 min^{-1} (STP).

3. Results and Discussion

The absorption cross-section of ozone at 761.9nm was determined as (2.86 ± 0.02) × 10^{-22} cm^2 $molecule^{-1}$. We revealed that the absorption cross-section of ozone in Wulf-Chappuis band increases very slightly as temperature increases. The results of previous reports and this work are compared in Fig.2. Burkholder et al. and we reported very close value and temperature dependence. But Burrows et al. reported different value and tendency.

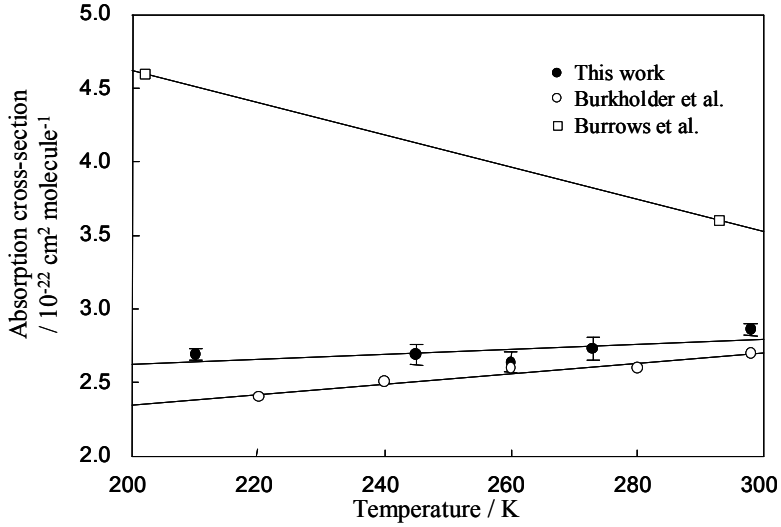

Fig. 2 Temperature dependence of the absorption cross section of ozone at 761.6nm